

Amendments to the Claims

Please amend the claims as indicated in the following listing of the claims, which replaces all prior versions thereof.

1. (Canceled)

2. (Original) ~~The frequency synthesizer of claim 1, wherein the phase locked loop further includes~~ A frequency synthesizer, comprising:

a phase locked loop comprising:

an analog mixer phase detector;

a programmable divider having an input terminal responsive to an output signal of the frequency synthesizer and having an output terminal coupled to an input terminal of the analog mixer phase detector;

a loop filter having ~~an~~ a first input terminal coupled to an output terminal of the analog mixer phase detector; and

a voltage controlled oscillator having a control terminal coupled to an output terminal of the loop filter; and

an auxiliary digital frequency detector having an output terminal coupled to a second input terminal of the loop filter.

3. (Original) The frequency synthesizer of claim 2, wherein the analog mixer phase detector is for detecting a phase difference between the output signal of the programmable divider and a reference signal.

4. (Original) The frequency synthesizer of claim 2, wherein the programmable divider includes a direct digital synthesizer.

5. (Original) The frequency synthesizer of claim 2, wherein the auxiliary digital frequency detector has a first input terminal coupled to the output terminal of the programmable divider.

6. (Original) The frequency synthesizer of claim 5, further comprising a comparator coupled between the output terminal of the programmable divider and the first input terminal of the auxiliary digital frequency detector.

7. (Currently Amended) The frequency synthesizer of claim 5, further comprising a differential integrator circuit coupled between the ~~having an input terminal responsive to an output signal terminal~~ of the auxiliary digital frequency detector, ~~and wherein an output terminal of the differential integrator circuit is coupled to the~~ and the second input terminal of the loop filter.

8. (Currently Amended) The frequency synthesizer of claim 7, wherein [:] the second input terminal of the loop filter includes is coupled to a timing capacitor such that an ; and

~~the~~ output terminal of the differential integrator circuit is coupled to the timing capacitor of the loop filter.

9. (Original) The frequency synthesizer of claim 8, further comprising a steering resistor coupled between the output terminal of the differential integrator circuit and the timing capacitor of the loop filter.

10. (Original) The frequency synthesizer of claim 9, wherein the programmable divider includes a direct digital synthesizer.

11. (Original) The frequency synthesizer of claim 10, further comprising a comparator coupled between the output terminal of the programmable divider and the first input terminal of the auxiliary digital frequency detector.

12. (Original) The frequency synthesizer of claim 10, further comprising a prescaler responsive to the output signal of the frequency synthesizer and coupled to the input terminal of the programmable divider.

13. (Original) The frequency synthesizer of claim 10, further comprising a balun transformer coupled between the output terminal of the programmable divider and the input terminal of the analog mixer phase detector.

14. (Original) The frequency synthesizer of claim 13, further comprising a bandpass filter coupled between the balun transformer and the input terminal of the analog mixer phase detector.

15. (Original) The frequency synthesizer of claim 14, further comprising an amplifier coupled between the bandpass filter and the input terminal of the analog mixer phase detector.

16. (Currently Amended) A frequency synthesizer, comprising:

a phase locked loop including comprising:

an analog mixer phase detector; and

an analog mixer phase detector;

a programmable divider having an input terminal responsive to an output signal of

the frequency synthesizer and having an output terminal coupled to an input terminal of the

analog mixer phase detector;

a loop filter having a first input terminal coupled to an output terminal of the

analog mixer phase detector; and

a voltage controlled oscillator having a control terminal coupled to an output

terminal of the loop filter; and

means, coupled to a second input terminal of the loop filter, for making the analog mixer

phase detector automatically acquire phase lock when the phase locked loop is out of lock.

17. (Canceled)

18. (Currently Amended) The frequency synthesizer of claim 17 18, wherein the programmable divider includes a direct digital synthesizer.

19. (Currently Amended) In a frequency synthesizer including a voltage controlled oscillator, a loop filter, and an analog mixer phase detector, a method comprising:
adjusting the voltage applied to the voltage controlled oscillator from the loop filter until the frequency of an output signal of the analog mixer phase detector is within a pass-band of the loop filter by providing a current to a timing capacitor of the loop filter to cause the voltage supplied to the voltage controlled oscillator to change based on a time constant of the loop filter.

20. (New) The frequency synthesizer of claim 2, wherein the auxiliary digital frequency detector is for providing a current to a timing capacitor of the loop filter to cause the voltage supplied to the voltage controlled oscillator to change based on a time constant of the loop filter.